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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No. : 09/914,966
Applicant(s) : LARRY NEIL MACKEY et al.
Filed : September 6, 2001
Title : ABSORBENT FLEXIBLE STRUCTURE
: COMPRISING STARCH FIBERS
TC/A.U. : 1771
Examiner : Cheryl Ann Juska
Conf. No. : 6640
Docket No. : 7456R
Customer No. : 27752

DECLARATION UNDER 37 CFR 1.132

Mail Stop RCE
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22213-1450

Dear Sir:

I, Larry Neil Mackey, hereby declare the following:

1. THAT, I am a named-inventor of the above-identified patent application;
2. THAT, I received a Ph.D. in Analytical Chemistry from The Ohio State University in 1975 and have been employed by The Procter & Gamble Company, as a

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Research Fellow assigned primarily to Procter & Gamble's starch fiber project, the subject of the present application, since 1998.

3. I am familiar with U.S. Patent No. 4,243,480 to Hernandez et al. ("Hernandez"). I have thoroughly reviewed Hernandez and it is my technical opinion that Hernandez fails to adequately teach fibers comprising starch, wherein the fibers have an average fiber diameter of less than 10 μm .

As is recognized by the Examiner, Hernandez teaches solvent spun fibers. Further, Hernandez explicitly describes obtaining its fibers via precipitation of a colloidal dispersion of starch in a coagulating salt solution. Hernandez, Col. 2, lines 24-32; Col. 3, lines 58-64.

Hernandez only teaches making one diameter of starch fiber, namely, a fiber having an average fiber diameter of 65 μm . Hernandez, Col 12, lines 39-49. Nowhere does Hernandez even attempt to teach making a starch fiber having an average fiber diameter of 10 μm . At the very most, Hernandez merely mentions that "the only requirement [of its fibers] being that the waterinsensitive [sic] fibers have a diameter of 10 to 500 microns." Hernandez, Col. 3, lines 59-61. Hernandez never explicitly teaches or enables one of ordinary skill in the art how to make a starch fiber having a fiber diameter of less than 10 μm using its solvent spinning process. In light of the foregoing, at the very most, Hernandez's brief mentioning of "requirements" of its fibers merely suggests to one of ordinary skill in the art to try making a fiber having a fiber diameter of 10 microns. Hernandez provides no reasonable expectation of success that a starch fiber having a fiber diameter of 10 microns can be made by its solvent spinning process.

It is well known that the diameter of a spun fiber is essentially equivalent to the diameter of the extrusion die through which the spun fiber is formed unless the spun fiber is subjected to extremely high attenuation forces. In other words, as is shown in Hernandez's Example 1, a 65 micron diameter fiber is formed by passing a dispersion of starch through 70.2 micron diameter apertures within a die. Accordingly, based on Hernandez's teachings, in order to produce 10 micron diameter fibers, one would have to pass a starch dispersion through about a 10 micron diameter aperture. This is not feasible since starch dispersions typically contain from 3-20 micron granules that would clog a 10 micron diameter aperture.

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As a result, I and my colleagues unexpectedly found that extremely high attenuation forces need to be applied to a spun starch fiber in order to obtain less than 10 micron diameter fibers. In one example we use about a 300 micron diameter extrusion die that would produce about 300 micron diameter fibers UNLESS extremely high attenuation forces are applied to the fiber. Since we subject the fiber to extremely high attenuation forces, our final fiber diameter is less than 10 microns. Hernandez does not teach significantly attenuating its fiber after exiting the die. The final diameter of a spun fiber is related to the elongation needed (attenuation facilitates elongation of the fiber). More particularly, for example, in order to obtain a 10 μm fiber from a starch composition that exits a 70 μm aperture in a die (as described in Hernandez's Example 1), the elongation required is equal to $(70 \mu\text{m})^2 / (10 \mu\text{m})^2$. However, Hernandez fails to mention, even in passing, the need to elongate and/or attenuate its fibers after they exit the die.

I, being one of at least ordinary, if not above ordinary skill in the art of starch fiber spinning, am not able to use the teachings of Hernandez to make a starch fiber having a fiber diameter of 10 microns. Therefore, it is my technical opinion that Hernandez falls well short of adequately describing and teaching how to make a starch fiber having a fiber diameter of 10 microns. Apparently, Hernandez only teaches how to make a starch fiber having an average fiber diameter of 65 microns. Hernandez, Col. 12, Example 1.

4. I am familiar with U.S. Patent No. 5,516,815 to Buehler et al. ("Buehler"). I have thoroughly reviewed Buehler and it is my technical opinion that Buehler fails to remedy the deficiencies associated with Hernandez, discussed above.

5. With regard to the claimed invention of the above-named application, I submit that I and my co-inventors have unexpectedly found that starch fibers having an average diameter of less than 10 μm can be produced via melt spinning and/or spunbond processes so long as significant amounts of attenuation air are applied to the fibers after exiting the dies in order to elongate the fibers to a final average fiber diameter of less than 10 μm . Before our discovery and invention, no one had ever been able to spin starch fibers having an average fiber diameter of less than 10 μm .

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I, Larry Neil Mackey, declare all statements made herein are true to the best of my knowledge, or if made upon information and belief, are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Further Declarant sayeth not.

Larry Neil Mackey
Larry Neil Mackey
Date: 12-07-05

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